

REMARKS

In order to expedite the prosecution of the present application, Claims 1 and 32 have been amended in order to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically speaking, the currently presented claims now require that substantially all of the activated carbon have a particle size between 0.6 mm and 0.212 mm. Support for this amendment is found at page 5 of the international specification, third full paragraph. No new matter has been added.

Claims 1, 27-32, 34 and 37-45 have been rejected under 35 USC 103(a) as being unpatentable over Keith et al in view of Crooks et al and Frund. Applicants once again respectfully traverse this ground of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a tobacco smoke filter containing activated carbon impregnated with a metal impregnant. The activated carbon is high-activity activated carbon having an activity of greater than 90% CTC prior to impregnation and substantially all of the activated carbon is of a particle size between 0.6 and 0.212 mm. The metal impregnant can be copper and molybdenum and a further embodiment of the present invention.

As discussed previously, the instant invention is based on the discovery that activated carbon having (1) an activity above 90% CTC, (2) a specific metal content amount and (3) a specific range of mesh size provides both a selective hydrogen cyanide reduction and a surprising retention of performance over a period of time. This is demonstrated in Table 3 in the present specification where the Examples of the present invention will correspond to sample numbers 5-8, 11-13, 15 and 27, which all include the appropriate level of metal impregnant, copper of at least 90% CTC and substantially all of the activated carbon is of a particle size between 0.6 mm

(30 mesh) and 0.212 mm (70 mesh), exhibit a significantly superior hydrogen cyanide reduction in the 87-93% region.

In contrast thereto, comparative sample reference number 3 contains carbon having an activity of 95% CTC but does not contain a metal impregnant. It illustrates an acceptable VP reduction but the hydrogen cyanide reduction is only 75%.

Comparative sample reference numbers 1, 2 and 10, which have a lower activity of 80% and 83% CTC, clearly exhibit an inferior VP reduction and selective reduction of hydrogen cyanide.

Comparative sample numbers 14 and 16 contain a metal impregnant and carbon having a CTC of 90% or greater but have a rather poor hydrogen cyanide reduction due to the larger mesh size which is excluded from the present claims.

Moreover, Table 5 shows that the Examples of the present invention, illustrated by Examples 8 and 11, unexpectedly retain their performance over an extended period of time as long as six months. This is clearly not expected in light of the prior art cited by the Examiner. With respect to Comparative sample reference 9, which has a carbon activity of 80% CTC and yet exhibits an extremely high selectivity for hydrogen cyanide, this is believed to be an anomaly or error and it would be expected that the activated carbon of this reference sample would not retain this performance over a six month time period. In general, high selectivity for hydrogen cyanide is not exhibited in activated carbons of less than 90% CTC.

As stated previously, the Keith reference is directed to a cigarette filter containing activated carbon which can be impregnated with from about 0.5 to 14% by weight of an oxide of a metal selected from the group consisting of cobalt, copper, zinc, iron, silver and molybdenum, either singly or in combination. Although Keith discloses the use of activated carbon, the activated carbons used in this reference do not have a high activity.

In the claims of Keith, the carbon is disclosed as being a carbon of at least 1 million square centimeters per gram

(100m<sup>2</sup>/g) and column 2, line 52 of this reference refers to a "good grade" having a surface area of in excess of 500 m<sup>2</sup>/g. There is no other measure disclosed in this reference which relates to the activity of the carbon. Coconut shell carbons have a reasonably well known relationship between surface area and CTC activity. This relationship shows a surface area of 500 m<sup>2</sup>/g corresponds to 30% CTC. An activity of at least 90% CTC, as required by the present claims, corresponds to a surface area of 1,500 m<sup>2</sup>/g for activated carbon provided from coconut shell carbons. In Keith, the experiments only use BPL carbons supplied by Calgon Carbon. The manufacturer of this carbon shows it to have a butane activity of 23.3% which is equivalent to about 60% CTC. Therefore, there is no disclosure in this reference of a "high-activity" activated carbon having activity greater than 90% CTC prior to impregnation as required by the present claims or discloses the unexpected benefits associated with the tobacco smoke filter of the present invention.

The claimed requirement that the "activated carbon have an activity greater than 90% CTC" is not an artificial or arbitrary value but, as set out on page 3, last paragraph, of the present specification, is a generally understood term of art indicating that the activated carbon has a "high activity". Therefore, the secondary references cited by the Examiner must provide the motivation to one of ordinary skill in the art to modify this reference in a manner that would yield the presently claimed invention. It is respectfully submitted that the secondary reference contains no such disclosure.

The Crooks et al reference is directed to a filter element having an absorbent material incorporated therein. The Examiner has stated that this reference discloses a cigarette filter that includes activated carbon that is impregnated with metals, with the activated carbon having a carbon tetrachloride activity of 60-150. However, there is no disclosure in this reference that any particular advantage

would be gained by an activated carbon having an activity between 60% and 150% as all of the activated carbons in this range are shown as being equivalent and, in fact, the activated carbons exemplified have a CTC of 85%. Given the equivalency between activated carbons having an activity between 60% and 150% in Crooks, one of ordinary skill in the art would only understand from this reference that any activated carbon is effective in accomplishing the purpose of this reference and high activity activated carbon is not needed. As such, this reference in fact teaches away from the high activity activated carbon of a specified mesh size together with a specified amount of metal impregnant to give an unexpected remarkable selectivity for hydrogen cyanide in a tobacco filter which unexpectedly does not deteriorate over time.


The Frund reference is directed to a respirator filter system used in filtering toxic agents, including organic vapors, acid gases, formaldehyde, ammonia, methyl amine and pesticides. As previously discussed, activated carbons used in respirators are not suitable for use in cigarette filters because they require a longer contact time and do not have any selectivity with respect to the other vapor components contained in tobacco smoke. There is no suggestion in this reference that the activated carbon used there in a respirator filter system could also be used in a cigarette filter. Therefore, only hindsight provided by the present disclosure is providing the motivation to the Examiner to combine the references in the manner done here in order to try to make a showing of prima facie obviousness under 35 USC 103(a).

As discussed previously, the objective test data of record in the present application clearly establishes the unobviousness of the presently claimed invention. This test data clearly establishes that in order to achieve a higher reduction of vapor phase material in combination with a high reduction of hydrogen cyanide and have an unexpectedly extended life of the cigarette filter, it is necessary that

the three requirements of the presently claimed invention be met. That is, the activated carbon have an activity of above 90% CTC, the specified amount of metal content must be present and the specified range of mesh size is necessary. This is clearly unexpected in light of the prior art cited by the Examiner and establishes the patentability of the presently claimed invention thereover.

Reconsideration of the present application and the passing of it to issue is respectfully solicited.

Respectfully submitted,

  
Terryence F. Chapman

TFC/smd

FLYNN, THIEL, BOUTELL  
& TANIS, P.C.  
2026 Rambling Road  
Kalamazoo, MI 49008-1631  
Phone: (269) 381-1156  
Fax: (269) 381-5465

|                         |             |     |
|-------------------------|-------------|-----|
| Terryence F. Chapman    | Reg. No. 32 | 549 |
| Mark L. Maki            | Reg. No. 36 | 589 |
| Liane L. Churney        | Reg. No. 40 | 694 |
| Brian R. Tumm           | Reg. No. 36 | 328 |
| Heon Jekal              | Reg. No. 64 | 219 |
| Eugene J. Rath III      | Reg. No. 42 | 094 |
| Dale H. Thiel           | Reg. No. 24 | 323 |
| David G. Boutell        | Reg. No. 25 | 072 |
| Sidney B. Williams, Jr. | Reg. No. 24 | 949 |

Encl: None

136.07/05